ENCLOSURE: TECHNICAL SUPPORT DOCUMENT FOR EPA CONCURRENCE ON 24-HOUR $PM_{2.5}$ EXCEEDANCES MEASURED AT ROSE PARK IN SALT LAKE COUNTY, UTAH JULY 4, 2017, AS AN EXCEPTIONAL EVENT

EXCEPTIONAL EVENTS RULE REQUIREMENTS

The EPA promulgated the Exceptional Events Rule (EER) in 2007, pursuant to the 2005 amendment of Clean Air Act (CAA) Section 319. In 2016, the EPA finalized revisions to the EER. The 2007 EER and the 2016 revisions added 40 CFR 50.1(j)-(r), 50.14 and 51.930 to the Code of Federal Regulations (CFR). These sections contain definitions, criteria for EPA approval, procedural requirements and requirements for air agency demonstrations. The EPA reviews the information and analyses in the air agency's demonstration package using a weight of evidence approach and decides to concur or not concur. The demonstration must satisfy all of the EER criteria for the EPA to concur with excluding the air quality data from regulatory decisions.

Under 40 CFR 50.14(c)(3)(iv), the air agency demonstration to justify data exclusion must include:

> A. "A narrative conceptual model that describes the event(s) causing the exceedance or violation and a discussion of how emissions from the event(s) led to the exceedance or violation at the affected monitor(s);"
> B. "A demonstration that the event affected air quality in such a way that there exists a clear causal relationship between the specific event and the monitored exceedance or violation;"
> C. "Analyses comparing the claimed event-influenced concentration(s) to concentrations at the same monitoring site at other times" to support requirement (B) above;
> D. "A demonstration that the event was both not reasonably controllable and not reasonably preventable;" and
> E. "A demonstration that the event was a human activity that is unlikely to recur at a particular location or was a natural event."

In 40 CFR 50.14(b)(2), the EPA indicates that exceedances caused by fireworks, where their use is significantly integral to traditional national, ethnic, or cultural events, will be treated in the same manner as exceptional events, provided the requirements of 40 CFR 50.14 are satisfied.

For concurrence, the air agency must meet several procedural requirements, including:

1. Submission of an Initial Notification of Potential Exceptional Event and flagging of the affected data in the EPA's Air Quality System (AQS) in accordance with 40 CFR 50.14(c)(2)(i);
2. Completion and documentation of the public comment process and provision of all comments received to the EPA in accordance with 40 CFR 50.14(c)(3)(v); and
3. Implementation of any applicable mitigation requirements in accordance with 40 CFR 51.930.

For data influenced by exceptional events to be used in initial area designations, air agencies must also meet the initial notification and demonstration submission deadlines specified in 40 CFR 50.14.

Narrative Conceptual Model

The EPA expects that a narrative conceptual model of the event will describe and summarize the event in question and provide context for analyzing the required statutory and regulatory technical criteria. Air

agencies may support the narrative conceptual model with summary tables, satellite images, maps, etc. For high particulate matter events resulting from the use of fireworks, the EPA recommends that the narrative conceptual model discuss the interaction of emissions and meteorology and, under 40 CFR 50.14(a)(1)(i), the regulatory significance of the requested data exclusion.

Clear Causal Relationship (CCR) and Supporting Analyses

The EPA considers a variety of evidence when evaluating whether there is a clear causal relationship between the specific event and the monitored exceedance or violation. For high particulate matter concentrations resulting from fireworks, air agencies should compare the relevant particulate matter data requested for exclusion with historical concentrations at the affected air quality monitor to help establish a clear causal relationship between the event and the monitored data. In addition to providing this information on the historical context for the event-influenced data, air agencies should further support the clear causal relationship criterion by providing evidence that the fireworks emissions were transported to the monitor and that the emissions from the fireworks influenced the monitored concentrations.

Not Reasonably Controllable or Preventable (NRCP)

The EPA requires that air agencies establish that the event be both not reasonably controllable and not reasonably preventable at the time the event occurred. This requirement applies to both natural events and events caused by human activities.

Natural Event or Event Caused by Human Activity That is Unlikely to Recur

According to the CAA and the EER, an exceptional event must be "an event caused by human activity that is unlikely to recur at a particular location or a natural event" CAA section 319(b)(1)(A)(iii); 40 CFR 50.1(j). Under 40 CFR 50.14(b)(2) emissions from fireworks will be treated in the same manner as exceptional events, provided the other requirements of 50.14 are met. Therefore, the recurrence of fireworks emissions from use of fireworks significantly integral to traditional national, ethnic, or other cultural events including, but not limited to, July Fourth celebrations that satisfy the requirements of section 50.14 does not prohibit the data treatment in the same manner as exceptional events.

EPA REVIEW OF EXCEPTIONAL EVENT DEMONSTRATION

Overview of Event

This Technical Support Document (TSD) covers an exceedance of the 24-hour $PM_{2.5}$ National Ambient Air Quality Standard (NAAQS) at the Rose Park monitoring station in Salt Lake County, Utah, on July 4, 2017. The primary Rose Park monitor recorded a $PM_{2.5}$ concentration of 40.0 $\mu g/m^3$, and two collocated $PM_{2.5}$ monitors recorded concentrations of 37.8 and 40.9 $\mu g/m^3$ on that date. The Utah Department of Environmental Quality's Division of Air Quality (DAQ) submitted an exceptional events demonstration to address the exceedances at several Utah $PM_{2.5}$ monitoring stations. $PM_{2.5}$ exceedances on July 4, 2017 at monitors other than Rose Park are not addressed in this EPA TSD.

DAQ submitted an Initial Notification of Potential Exceptional Event for the July 4, 2017 exceedance via email on February 2, 2019. The demonstration was posted for public comment for 30 days, from October 1 to November 1, 2017, and DAQ indicated that it received one supportive comment. The EPA

received the demonstration on November 21, 2017. Utah then resubmitted an amended demonstration with the initial notification on February 2, 2019. On April 16, 2019, the EPA indicated that the demonstration did not provide all the information needed to establish a clear causal relationship between fireworks use and the exceedance at Rose Park on July 4, 2017; as a result, the EPA requested supplemental information per 40 CFR 51.14(c)(3)(vi). Utah submitted additional information in a revised demonstration to the EPA on April 18, 2019. The EPA prepared the tabulation of flagged data at Rose Park shown in Table 1.

Table 1. EPA 1- and 24-hour $PM_{2.5}$ Exceedance and Flagged Data Summary

Exceedance Date (times MST)	Monitor/Site Name	AQS ID	$PM_{2.5}$ ($\mu g/m^3$)
July 4, 2017 (24-hr)	Rose Park POC 1 FRM	49-035-3010-1	37.8
July 4, 2017 (24-hr)	Rose Park POC 2 FRM	49-035-3010-2	40.9
July 4, 2017 00:00 (1-hr)	Rose Park POC 3 FEM (primary monitor)	49-035-3010-3	38.3
July 4, 2017 01:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	22.4
July 4, 2017 02:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	22.6
July 4, 2017 03:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	10.4
July 4, 2017 04:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	11.0
July 4, 2017 05:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	10.1
July 4, 2017 06:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	10.9
July 4, 2017 07:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	9.7
July 4, 2017 08:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	7.3
July 4, 2017 09:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	9.2
July 4, 2017 10:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	6.8
July 4, 2017 11:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	8.3
July 4, 2017 12:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	4.3
July 4, 2017 13:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	4.5
July 4, 2017 14:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	5.0
July 4, 2017 15:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	6.3
July 4, 2017 16:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	5.1
July 4, 2017 17:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	4.8
July 4, 2017 18:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	6.1
July 4, 2017 19:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	7.0
July 4, 2017 20:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	18.5
July 4, 2017 21:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	279.6
July 4, 2017 22:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	357.8
July 4, 2017 23:00 (1-hr)	Rose Park POC 3 FEM	49-035-3010-3	94.7
July 4, 2017 (24-hr avg)	Rose Park POC 3 FEM	49-035-3010-3	**40.0**

Narrative Conceptual Model

The Conceptual Model from the Utah demonstration is as follows:[1]

> *The Fourth of July, also known as Independence Day or July 4th, has been a federal holiday in the United States since 1941. It is traditionally celebrated with evening fireworks. Fireworks generate transient, episodes of high concentrations of particle (PM) and gaseous air pollutants.*

[1] $PM_{2.5}$ Exceptional Event – Independence Day Fireworks; Event Date – July 4, 2017; Rose Park Monitoring Station, Final Revision, April 18, 2019, Utah DAQ, pp. 2-3; hereafter, Utah Final Demonstration.

Elevated PM levels were noted on the evening of July 4, 2017 at the Rose Park monitoring stations, which resulted in exceedances of the 24-hour $PM_{2.5}$ ambient air quality standard;

- *Rose Park filter values:*
  - *Primary monitor[2] – 37.8 $\mu g/m^3$*
  - *Co-located monitor – 41 $\mu g/m^3$*

Rose Park is located at 1400 West Goodwin Ave, Salt Lake City. The station is situated within a residential area and adjacent to a large grass field conducive for fireworks.

The location of the Rose Park monitoring station is shown in in Figure 1 from the Utah Final Demonstration.

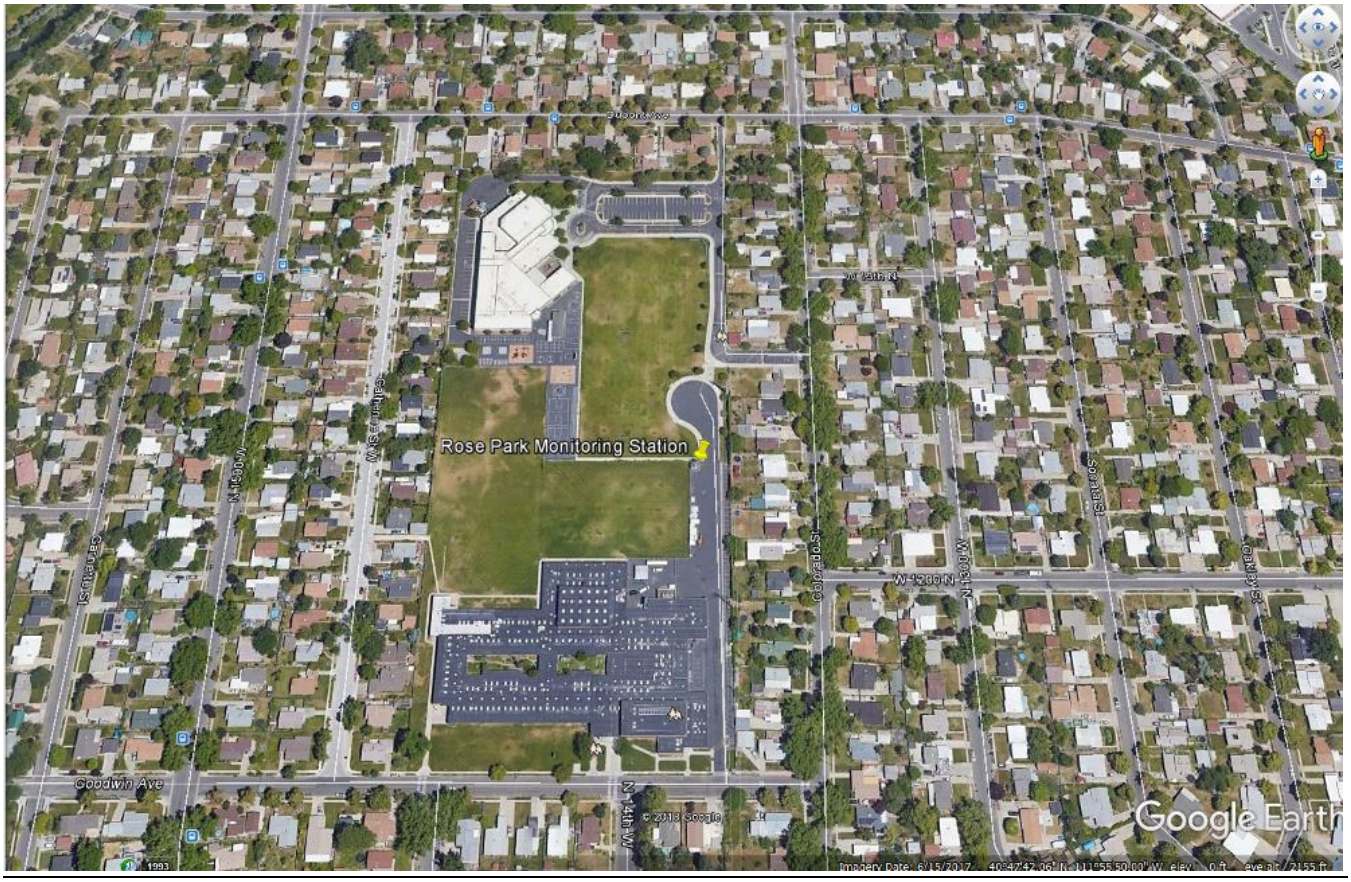

Figure 1. Rose Park Monitor Location, Salt Lake City, Utah

Regulatory Significance

Neither the Initial Notification email nor the Utah demonstration indicated the regulatory significance of the July 4, 2017 exceptional event. Subsequent to the initial notification, DAQ indicated by phone on February 7, 2019, that the July 4, 2017 flagged exceedance at Rose Park was significant due to its

[2] Subsequent to the preparation of the original Utah demonstration in 2017, the continuous (hourly data) monitor at Rose Park was designated the primary monitor, so this designation of primary in the Utah demonstration is not accurate. However, this does not change our analysis.

impact on calculating an attaining 2016-2018 $PM_{2.5}$ design value for use in an anticipated clean data determination request for the Salt Lake City 24-hour $PM_{2.5}$ nonattainment area (NAA).

The following assessment of regulatory significance was prepared by the EPA since regulatory significance was not addressed by DAQ in its initial notification or its demonstration.

In 2006, the EPA strengthened the 24-hour $PM_{2.5}$ NAAQS from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. In 2009, 3 years following the NAAQS revision, areas were designated, and all or parts of Box Elder, Weber, Davis, Salt Lake and Tooele counties in Utah were designated non-attainment as the Salt Lake City $PM_{2.5}$ NAA. The area was initially classified as a Moderate $PM_{2.5}$ nonattainment area under CAA subpart 4, part D, title I, and it was reclassified to Serious nonattainment in June 2017, when it did not attain the standard by the Moderate area attainment date. Under 40 CFR 51.1015, the EPA can suspend certain Moderate and/or Serious area planning requirements when the EPA has determined that the area is attaining the NAAQS ("clean data determination").

The Rose Park monitor was installed in April 2007 and had its first valid design value (the 3-year average of annual 98^{th} percentile 24-hour $PM_{2.5}$) in 2009. From 2009 through the 2018 design value (the average of 2016-2018 data), Rose Park has had a violating design value every year except 2012, when the design value equaled the NAAQS at 35 $\mu g/m^3$; removing two flagged data values in 2017 results in a 2016-2018 design value of 35, rather than 36 when the flagged data are retained. In 2017, the nominal 98^{th} percentile (included all flagged and unflagged data) is the 8^{th} maximum value, 35.8 $\mu g/m^3$ recorded on January 31, 2017. The 4^{th} maximum in 2017, however, is 40.0 $\mu g/m^3$ recorded on July 4 and flagged as a firework exceptional event, and the 6^{th} maximum is 36.8 $\mu g/m^3$ recorded on September 6, 2017 and flagged as a wildfire exceptional event (addressed in a separate concurrence). If both these exceptional event claims receive EPA concurrence, the 2017 98^{th} percentile would drop to the current 10^{th} maximum value (32.4 $\mu g/m^3$ recorded on December 10 and 29, 2017), and the resulting 2016-2018 design value would go from a violating 36 $\mu g/m^3$ to an attaining 35 $\mu g/m^3$. Beginning in 2017, all other monitors in the Salt Lake City NAA have attained the NAAQS, so exceptional event concurrences will give the Rose Park an attaining design value, and all Salt Lake City NAA monitors will be attaining. The effect of concurring on both exceptional event claims is shown by the green line relative to the red line in Figure 2.

The assessment of the adequacy of the narrative conceptual model is provided in Table 2.

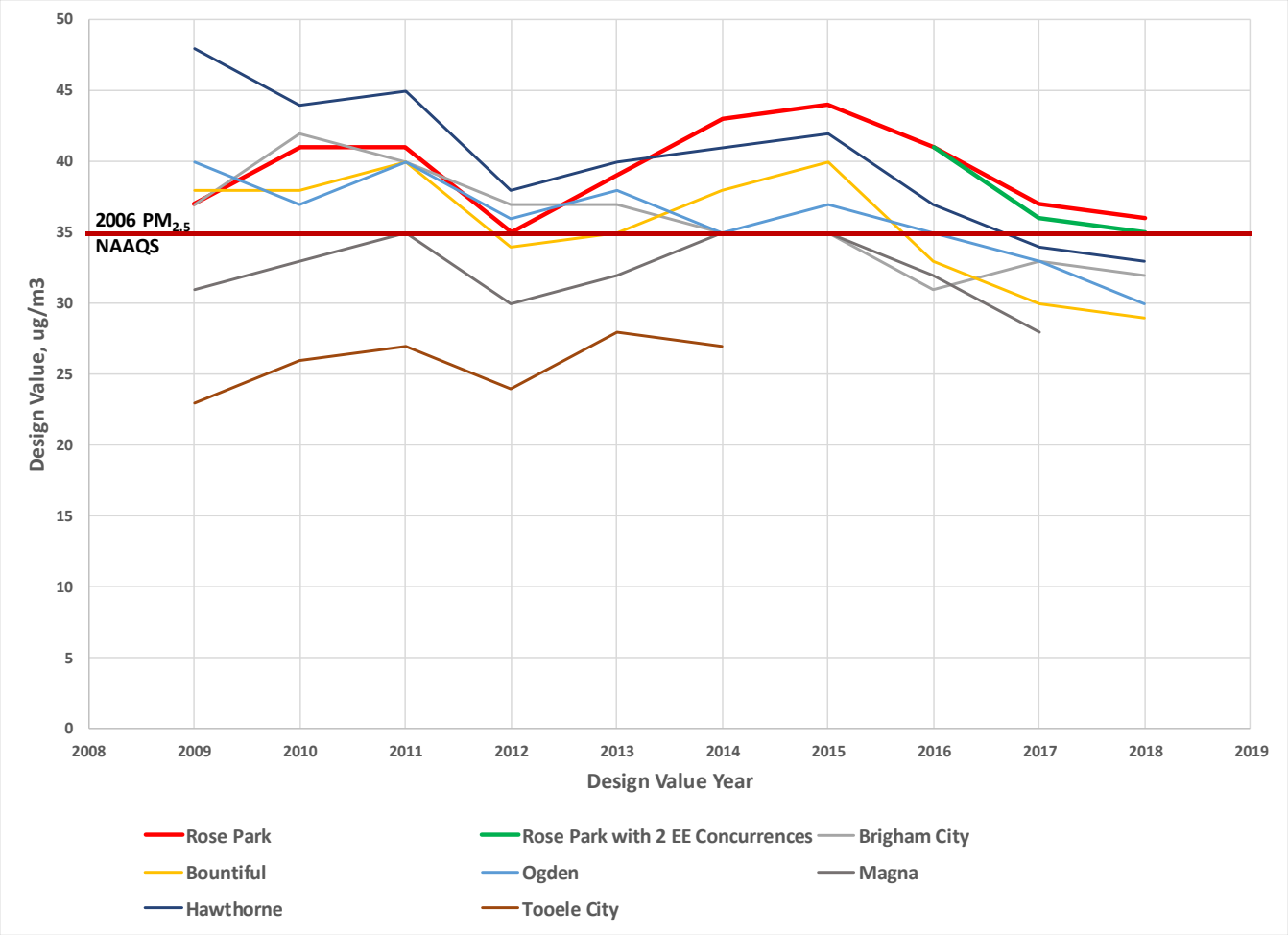

Figure 2. Salt Lake City Design Value History, 2009-2018; Rose Park in Red, Impact of Concurrence on July 4 and September 6, 2019 Flags Shown in Green

Table 2. Documentation of Narrative Conceptual Model

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 4, 2017	Utah Final Demonstration, pp. 2-3 Utah Final Demonstration pp. 3-9 EPA TSD pp. 5-6	Sufficient, when combined with Clear Causal Relationship section and EPA-provided evaluation of regulatory significance	Yes

Clear Causal Relationship (CCR)

Clean Air Act section 319 requires that:

> *a clear causal relationship must exist between the measured exceedances of a national ambient air quality standard and the exceptional event to demonstrate that the exceptional event caused a specific air pollution concentration at a particular air quality monitoring location*[3]

[3] Clean Air Act 319(b)(3)(B)(ii), as amended in 2005.

With the 2016 revision to the EER, the EPA published Table 3, containing example analyses which could be used in a weight of evidence demonstration of a clear causal relationship between a potential exceptional event and a specific exceedance.[4]

Table 3. Example Clear Causal Relationship Evidence and Analyses

Example of Clear Causal Relationship	Types of analyses/information to support the evidence
Comparison to Historical Concentrations	Analyses and statistics showing how the observed event concentration compares to the distribution or time series of historical concentrations of the same pollutant.
Occurrence and geographic extent of the event	Special weather statements, advisories, news reports, nearby visibility readings, measurements from regulatory and non-regulatory (e.g., special purpose, emergency) monitoring stations throughout the affected area, satellite imagery.
Transport of emissions related to the event in the direction of the monitor(s) where the measurements were recorded.	Wind direction data showing that emissions from sources identified as part of the ''not reasonably controllable or preventable'' demonstration were upwind of the monitor(s) in question, satellite imagery, monitoring data showing elevated concentrations of other pollutants expected to be in the event plume.
Spatial relationship between the event, sources, transport of emissions and recorded concentrations.	Map showing likely source area, wind speed/direction and pollutant concentrations for affected area during the time of the event, trajectory analyses.
Temporal relationship between the event and elevated pollutant concentrations at the monitor in question.	Hourly time series showing pollutant concentrations at the monitor in question in combination with wind speed/direction data in the area where the pollutant originated/was entrained or transported.
Chemical composition and/or size distribution (for $PM_{2.5}$ to PM_{10}) of measured pollution that links the pollution at the monitor(s) with particular sources or phenomenon.	Chemical speciation data from the monitored exceedance(s) and sources, size distribution data.
Comparison of event-affected day(s) to specific non-event days.	Comparison of concentration and meteorology to days preceding and following the event, comparison to high concentration days in the same season (if any) without events, comparison to other event days without elevated concentrations (if any), comparison of chemical speciation data.

As further clarification for the first item (comparison to historical concentrations), the preamble for the 2016 EER revision provided

[4] 81 FR 68241, October 3, 2016, Table 1.

Table 4 “as guidance.”[5]

[5] 81 FR 68242, October 3, 2016, Table 2.

Table 4. Evidence and Analyses for the Comparison to Historical Concentrations

Historical concentration evidence	Types of analyses/information [a]
1. Compare the concentrations on the claimed event day with past historical data.	• Provide the data in the form relevant to the standard being considered for data exclusion. • Present monthly maximums of the NAAQS relevant metric (e.g., maximum daily 8-hour average ozone or 1-hr SO_2) vs presenting monthly or other averaged daily data as this masks high values for the most recent 5-year period that includes the event(s).[b] • Alternatively, if informative, include separate plots for each year (or season).[c] • See examples at https://www.epa.gov/sites/production/files/2015-05/documents/ideasforshowingeeevidence.pdf and Question 3 in the Interim Q&A document provides additional detail.[d]
2. Demonstrate spatial and/or temporal variability of the pollutant of interest in the area.	Prepare one or more time series plots showing the concentrations of the pollutant of interest at the affected monitor and nearby monitors. • Compare concentrations on the claimed event day with a narrower set of similar days by including neighboring days at the same location (e.g., a time series of two to three weeks) and/or other days with similar meteorological conditions (possibly from other years) at the same or nearby locations with similar historical air quality along with a discussion of the meteorological conditions during the same timeframe.[e]
3. Determine percentile ranking	• Determine 5-year percentile of the data requested for exclusion on a per monitor basis. • Determine the annual ranking of the data requested for exclusion. This assessment may be potentially helpful to show when the non-event concentrations during the year with the exclusion request were lower than surrounding years.
4. Plot annual time series to show the range of ''normal'' values (i.e., Display Interannual Variability) [f]	• Prepare a time series plot covering 12 months (or all months in which the data were collected) overlaying at least 5 years of monitoring data from the event-influenced monitor to show how monitored concentrations compare at a given time of year and/or coincide with the subject event. This plot will display the non-event variability over the appropriate seasons or number of years. • For annual comparisons, use the daily statistic (e.g., maximum daily 8-hour average, or maximum 1-hour) appropriate for the form of the standard being considered for data exclusion.
5. Identify all ''high'' values in all plots.	• Label ''high'' data points as being associated with concurred exceptional events, suspected exceptional events, other unusual occurrences, or high pollution days due to normal emissions (provide evidence to support the identification when possible). • Include comparisons omitting known or suspected exceptional events points, if applicable.
6. Identify historical trends (optional if this trends analysis provides no additional ''weight'').	• Describe how pollutant concentrations have decreased over the 5-year window, if applicable. • Identify and discuss trends due to emission reductions from planning efforts and/or implementing emission control strategies. • Identify and discuss trends or other variability due to meteorology or economics of an area. • If appropriate, create a plot to show how a downward trend in pollutant concentrations over the 5-year historical data record obscures the uniqueness of the event-related concentration.

[a] While the EPA recommends using 5 years of data in analyses to support the comparison to historical concentrations, we recognize that there may be exceptions to using 5 years of data such as when 5 years of data are not available for a given monitor or in case-by-case analyses such as those for prescribed fire on wildlands.

[b] Section 8.4.2.e of appendix W (proposed revisions at 80 FR 45374, July 29, 2015) recommends using 5 years of adequately representative meteorology data from the National Weather Service (NWS) to ensure that worst-case meteorological conditions are represented. Similarly, for exceptional events purposes, the EPA believes that 5 years of ambient air data, whether seasonal or annual, better represent the range of ''normal'' air quality than do data from shorter periods.

[c] ''Season'' can be pollutant and area specific. For example, the EPA defines ozone monitoring seasons in Table D–3 to Appendix D of Part 58: ''Ozone Monitoring Season by State.'' These seasons include, but may be longer than, an area's typical photochemical ozone season. For exceptional events purposes, an area may want to include both the typical photochemical ozone season and the ''season'' in which the event happened (if they are different). Similarly, the ''season'' for PM may be in the winter (for areas influenced by wood smoke). The general concept behind ''seasonal'' analyses is to compare the season of anthropogenic pollutant generation to the season in which the event occurred.

[d] Interim Exceptional Events Rule Frequently Asked Questions. U.S. EPA. May 2013. Available at http://www2.epa.gov/sites/production/files/2015-05/documents/eer_qa_doc_5-10-13_r3.pdf.

[e] If an air agency compares the concentration on the claimed event day with days with similar meteorological conditions from other years, the agency should provide information regarding any changes in wind patterns or sources of emissions of the pollutant(s) of concern in the area, including increases or reductions in the emissions inventory, or other known source of emissions information, that could affect the concentration of the pollutant(s) of concern during the exceptional event. If an air agency compares the concentration on the claimed event day to days immediately preceding and following the event day, the air agency should discuss and compare the meteorology on those days.

[f] The EPA does not intend to identify a particular historical percentile rank point in the seasonal or annual historical data that plays a critical role in the analysis or conclusion regarding the clear causal relationship.

In its final demonstration (submitted April 18, 2019), DAQ provided evidence to show a clear causal relationship for the July 4, 2017 exceedance at Rose Park (and two other sites in Utah), as follows:[6]

1. *Fireworks are a source of intense episodic PM emissions.*

2. Wind conditions were stagnant across the Wasatch Front such that the PM levels could not have been derived from a dust storm, wildfire or local fire.

3. Air quality before and after the traditional firework hours were at normal levels.

4. A two-hour intense spike occurred when fireworks are set off on July 4.

5. Compliance records show that there were no smoke complaints or releases in the Wasatch Front on or about July 4.[7]

6. Community sponsored fireworks events were not sufficiently close to Rose Park to suspect them as contributors to the event.

7. DAQ is aware that the adjacent grass field has been used in past years to set off local fireworks.

8. Utah law permits the use of aerial fireworks designed to travel up to 150 feet into the air and then explode. This type of fireworks, in close proximity to Rose Park, would generate emissions sufficient to cause air quality exceedances. We conclude that the episodic short lived intense $PM_{2.5}$ and PM_{10} levels must have been derived from ground level fireworks set off at the adjacent grass field.

The demonstration included a plot of wind speed and direction for the period June 30, 2017 to the morning of July 5, 2017. Winds dropped from 7.8 mph on the afternoon of July 4 to 2.6 mph on the evening of July 4 (10:00 pm to 12:00 am) at Rose Park. The demonstration evaluated and showed little or no potential impact to the Rose Park monitor from area or regional fires, wind blown dust, or non-compliant anthropogenic sources.

Historical Data Comparison

DAQ provided the data in Table 5 and Figure 3 for historical data comparison. The Utah demonstration states that "The table below shows $PM_{2.5}$ concentrations three days before and three days after the 4th of July, indicating that there is a clear causal relationship between the fireworks on July 4th and the air quality exceedances." While the table and figure show that $PM_{2.5}$ was higher on the evening of July 4th than on prior and subsequent days, it does not show the cause of that elevated $PM_{2.5}$, so the data by itself is not sufficient to establish that fireworks were the cause of the high values. DAQ also provided hourly $PM_{2.5}$ concentrations for hours 1800 to 2300 (shown in Table 1), the graphical representation of all 2017 $PM_{2.5}$ data at Rose Park shown in Figure 4, and the summary of annual $PM_{2.5}$ statistics at Rose Park for 2011-2017 shown in Table 6.

[6] Utah Final Demonstration.

[7] DAQ did indicate, however, that a 25-acre fire started at about 10:30 pm in Cottonwood Heights, 4 miles southeast of the Rose Park monitor, but concluded winds were too light for transport smoke from that fire to the Rose Park monitor before the midnight end of the monitoring day. DAQ indicated that the cause of the fire was an individual setting off aerial fireworks; see Utah Final Demonstration, p. 5.

Table 5. Utah Demonstration Historical Data Table ($PM_{2.5}$ Concentrations ($\mu g/m^3$))[8]

	Rose Park	Rose Park Co-located
1-Jul-17	11.4	12.6
2-Jul-17	9.3	11
3-Jul-17	14.5	19.1
4-Jul-17	37.8	41
5-Jul-17	14	16.9
6-Jul-17	10.3	12.9
6-Jul-17	10.7	13.4

* Continuous monitor averages

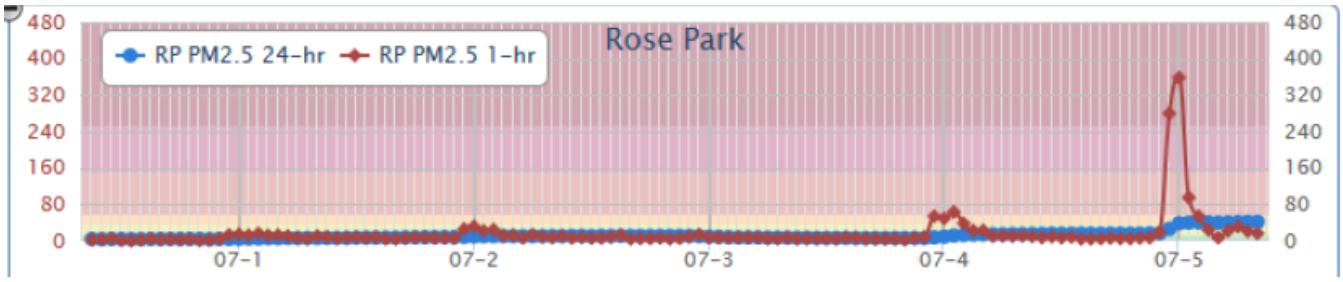

Figure 3. $PM_{2.5}$ hourly Data at Rose Park, June 30-July 5, 2017[9]

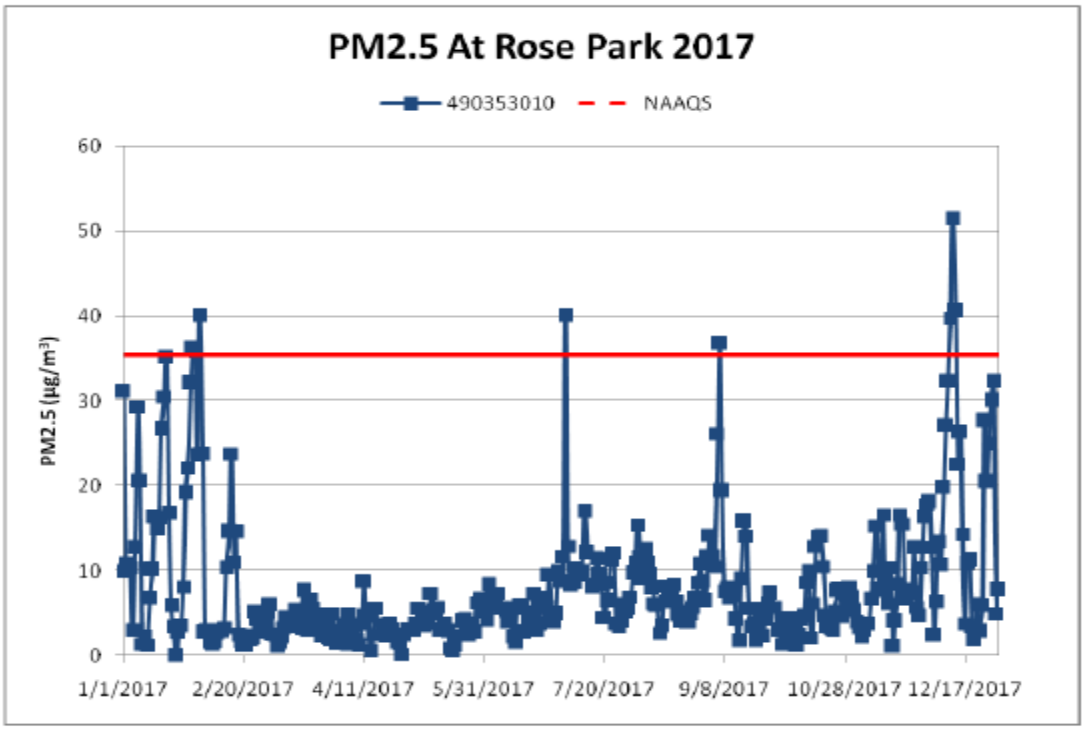

Figure 4. $PM_{2.5}$ Collected by the Primary FEM Monitor at Rose Park in 2017[10]

[8] Utah Final Demonstration, p. 3.
[9] Ibid. p. 4.
[10] Utah Final Demonstration, p. 7.

Table 6. Utah Final Demonstration Summary of Rose Park Historical $PM_{2.5}$ Data[11]

24-hr Filter PM2.5

Year	Observations	Annual Mean (ug/m^3)	July Mean ($\mu g/m^3$)	Annual Max (ug/m^3)	Date of Max Value
2011	346	9	7.9	43.7	January 28
2012	340	9	10.3	35.5	January 5
2013	282	10.9	9.1	56.3	December 31
2014	278	11.3	9.9	55.8	January 20
2015	353	8.4	8.3	56.4	January 9
2016	322	9.4	8.9	64.8	February 12
2017	322	12.6	11.1	51.4	December 12

The historical data provided in the Utah Final Demonstration does not include enough information on historical $PM_{2.5}$ seasonality and frequency of exceedances in the summer season to allow the July 4, 2017 exceedance to be understood in context. The EPA therefore provided the assessment below to better represent the demonstration elements shown in

[11] Ibid., p. 8.

Table 4 and requested in the 2016 EER revision.

EPA Evaluation of Historical Data

The Salt Lake Valley can experience strong temperature inversions in the winter months. When these inversions are strong and persistent enough, emissions in the valley can cause the 24-hour average $PM_{2.5}$ concentrations to exceed the NAAQS. As a result, the 24-hour average $PM_{2.5}$ concentrations are typically highest from approximately December 1 through March 31 each year (Figure 5). These high values cause the 99th percentile of the combined 2007 to 2018 24-hour $PM_{2.5}$ data to be 47 $\mu g/m^3$. This is useful in comparing the relative frequency of the subject flagged value on July 4, 2017 (40.0 $\mu g/m^3$) with the long term 99th percentile (occuring on average about 3 or 4 times per year). The flagged concentration, in a long-term comparison, could be expected several times each year, so the clear causal relationship demonstration needs to be relatively robust, compared to that needed for a concentration well over the 99th percentile value.

The historical data also show some elevated 24-hour $PM_{2.5}$ concentrations in the summer months. With the exception of 2018 data, all exceedances which have occurred between March 30 and September 30 at the Rose Park monitor have been flagged as exceptional events. These include high wind dust storm flags on March 30 and April 27, 2010, July 4th fireworks flags in 2007, 2009, 2013 and 2017, and a wildfire flag on September 6, 2017. Two other days in 2018 (August 4 and 11) exceeded the NAAQS and have currently not been flagged by DAQ. Satellite imagery suggests that these 2018 exceedances could also have been due to or impacted by wildfire smoke.

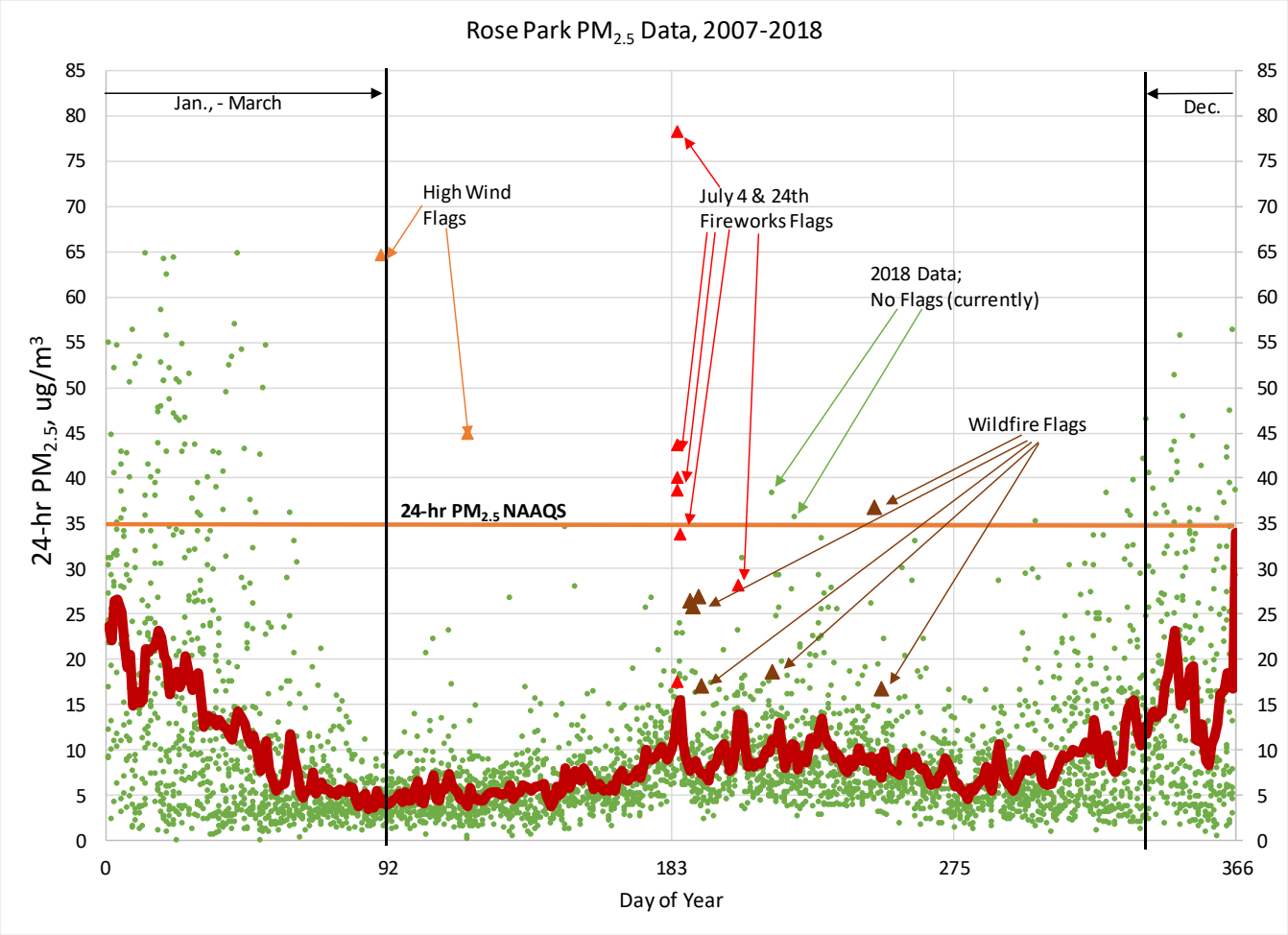

Figure 5. 24-hour Average $PM_{2.5}$ Concentrations at the Rose Park Monitor (2007-2018); High Wind Flags Orange; Fireworks Flags Red; Wildfire Flags Brown; Mean Daily $PM_{2.5}$ Heavy Red Line (EPA analysis of data from the AQS database)

In total, there have been nine warm season exceedances of the $PM_{2.5}$ NAAQS at Rose Park in the period 2007-2018: two attributed to high wind dust, four attributed to July 4 fireworks, two in 2018 of unidentified cause (but possibly wildfire) and one attributed to wildfire smoke.

In addition to these exceedances, there have been seven days in the period 2007-2018 where $PM_{2.5}$ during warm season conditions between March 1 and September 30 was between 30 and 35.4 $\mu g/m^3$ (non-exceedance values). In summary there have been nine warm season exceedances and seven warm season near exceedances in the 12 years the Rose Park monitor has been operating, or about 1 1/3 exceedance or near exceedance values per year. All the historical warm season values over 30 $\mu g/m^3$ have either been claimed as exceptional events or are suspected to have been impacted by exceptional event emissions. From this it can be concluded that warm season exceedances occur almost annually, and the cause for any given exceedance can not be conclusively assumed from the date of the event.

EPA Clear Causal Relationship Evaluation

The meteorology station at Rose Park has only reported wind speed and direction data to the EPA AQS database since January 1, 2018, so wind data from Rose Park on July 4, 2017 are not available in AQS. The National Weather Service meteorology station at Salt Lake International (SLI) Airport is 2.5 miles

southwest of the Rose Park monitoring station, so the airport station is a reasonable surrogate for Rose Park wind conditions when wind data from Rose Park are not available. $PM_{2.5}$ data from Rose Park on July 4-July 5, 2017, indicates that hourly $PM_{2.5}$ rose above the 35 µg/m^3 $PM_{2.5}$ NAAQS during the period from 9:00 pm July 4 to 1:00 am July 5 (MST). The EPA evaluated historical July 4 winds at the airport meteorology station for the 9:00 pm to 12:00 am period on July 4 in 2007-2018. The results are shown in Figure 6. The figure shows that for the three July 4 exceedances prior to 2017, average wind speed was less than 5.5 mph, while for all historical July 4ths when winds were over 5.5 mph, $PM_{2.5}$ was between 15.7 µg/m^3 and 27.3 µg/m^3. July 4, 2017, with 40 µg/m^3 recorded on the primary monitor, could be considered an outlier, with more $PM_{2.5}$ than would be expected given the average SLI wind speed (8.2 mph), based on historical data.

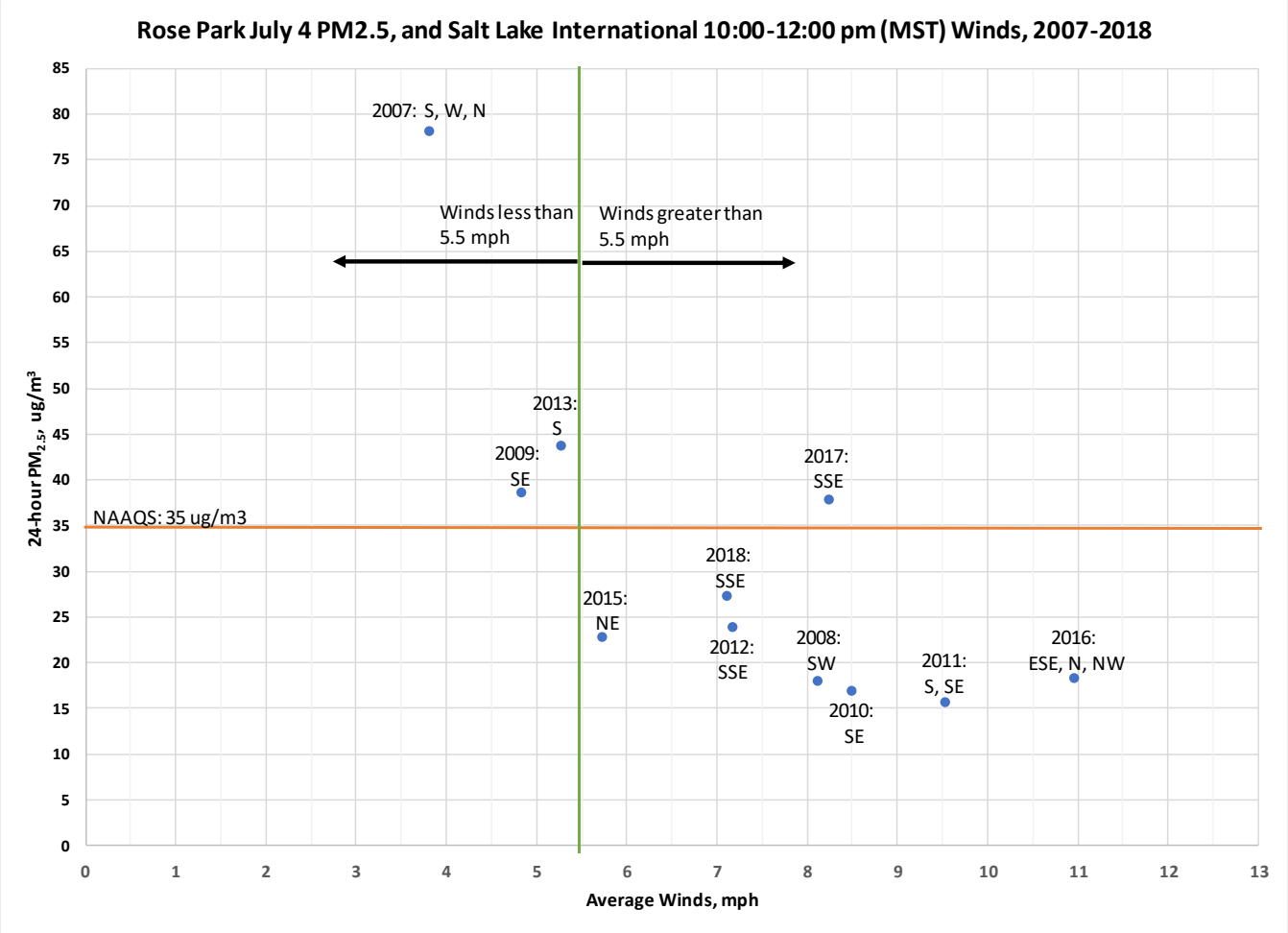

Figure 6. Historical 9:00 pm to 12:00 am Average Wind Speed (Salt Lake International Airport) vs. July 4 24-hour $PM_{2.5}$ at Rose Park, 2007-2018; Wind Directions Indicated

While DAQ has only reported winds from Rose Park to AQS since January 1, 2018, DAQ began reporting wind data to the University of Utah MESOWEST meteorology database on December 9, 2016,[12] and to the EPA real-time AIRNow database on November 26, 2016.[13] The EPA evaluated the historical relationship between wind data from the Rose Park monitoring station and the SLI Airport meteorology station in order to see if the wind speeds on July 4, 2017, at Rose Park were typical, or

[12] https://mesowest.utah.edu/cgi-bin/droman/meso_base_dyn.cgi?stn=QRP.
[13] http://www.airnowtech.org/.

might have been unusually low compared to the Airport station. Unusually low wind speeds could have contributed to poor dispersion, and higher $PM_{2.5}$ concentrations than the historical relationship shown in Figure 6 would predict. The historical relationship along with the July 4, 2017 nighttime data are shown in Figure 7. The trend line for the data regression shows that Rose Park winds are typically lower than those at SLI (typical, for example: 10 mph at SLI corresponds to 6 mph at Rose Park). While not outliers (that is, not lying outside the body of all historical data), the data from the night of July 4, 2017, are lower at Rose Park compared to SLI than would be typical (i.e., 10 mph winds on July 4, 2017, at SLI correspond to 2.6 mph winds at Rose Park). Unfortunately, wind data is only available at Rose Park on July 4, 2017 and 2018, so the relationship shown in Figure 7 cannot be further assessed with respect to local micrometeorology at Rose Park for the entire historical data set of Figure 6. The lower than typical winds at Rose Park on July 4, 2017, could have contributed to higher than predicted $PM_{2.5}$.

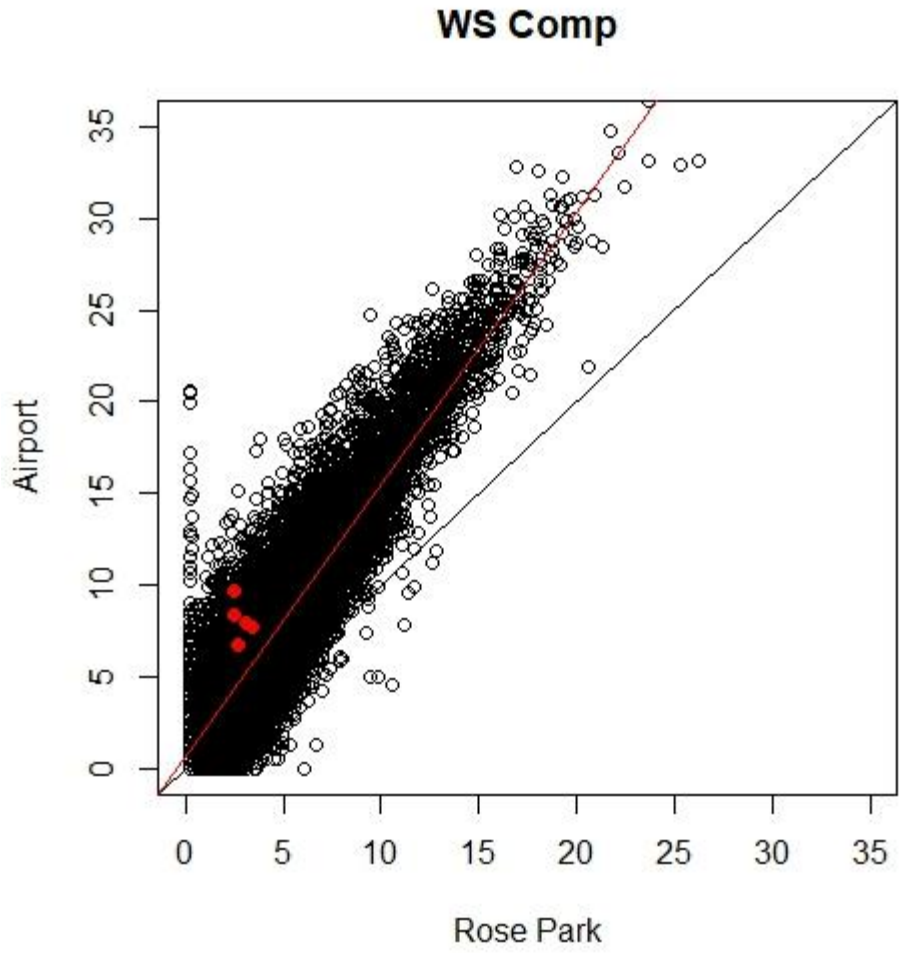

Figure 7. Historical Relationship Between Salt Lake International Airport and Rose Park Winds, July 4, 2017 Red Dots; Red Line is the Least Squares Regression (EPA analysis of AQS, AIRNow and MESOWEST data)

The Utah Final Demonstration states that Utah statute 53-7-225 allows private discharge of display fireworks three days before and three days after July 4 and July 24 each year, and that "Display fireworks is [*sic*] defined as 'includes aerial shells, salutes, roman candles, flash shells, comets, mines,

and other similar explosives.'" The demonstration discusses the likelihood of fireworks impacts from large public displays (small impact with the nearest in Jordan Park, 3.5 miles upwind) and personal fireworks near the monitoring stations, and states that:

> *The met[eo]rological section below shows that the prevailing winds were below 3 mph, essentially ruling out fireworks from Jordan Park and pointing to ground level fireworks from the adjacent grass field. The PM concentration increased 300-fold in about 1 hour strongly suggesting that the emission source had to be near the station.*[14]

The demonstration concludes that:

> *Utah law permits the use of aerial fireworks designed to travel up to 150 feet into the air and then explode. This type of fireworks, in close proximity to Rose Park, would generate emissions sufficient to cause an air quality exceedances* [sic]. *We conclude that the episodic short lived intense $PM_{2.5}$ and PM_{10} levels must have been derived from ground level fireworks set off at the adjacent grass field.*

The EPA's assessment of the clear causal relationship between fireworks emissions and the exceedances at Rose Park on July 4, 2017 is shown in Table 7.

Table 7. Documentation of CCR

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 4, 2017	Utah Final Demonstration, pp. 3-9 EPA TSD, pp. 12-15	Sufficient, with additional information from the EPA	Yes

Not Reasonably Controllable or Preventable (nRCP)

The Utah Final Demonstration, for the purposes of showing that July 4 exceedances due to fireworks are not reasonably controllable or preventable, states that:

> *The State Legislature has passed into statute (53-7-225) legal discharge of display fireworks three days before and three days after the 4th and 24th of July. Fireworks are permitted between the hours of 11 a.m. and midnight on July 4th and 24th. Display fireworks is* [sic] *defined as "includes aerial shells, salutes, roman candles, flash shells, comets, mines, and other similar explosives." Municipalities and or fire marshals can prohibit fireworks in certain areas due to fire hazards such as, dry conditions in the foothills. There are approximately 31 municipalities along the Wasatch Front that have historically presented fireworks displays on the 4th of July. Consequently, DAQ cannot control or prevent legal fireworks as per state statute. DAQ does however make a good faith effort each year to warn the public of the health effects of fireworks as described in the Mitigation section.*

The EPA stated in the 2007 Exceptional Events preamble that:

[14] Utah Final Demonstration, p. 4.

Some national and/or cultural traditions, such as July 4th Independence Day and the Chinese New Year, have long included fireworks displays as important elements of their observances. While this issue is not specifically covered in CAA section 319, EPA believes that Congress did not intend to require EPA to consider air quality violations associated with such cultural traditions in regulatory determinations.

Given this approach, the EPA finds the Utah Final Demonstration for NRCP adequate, as reflected in Table 8.

Table 8. Documentation of nRCP

Exceedance Date	Demonstration Citation	Quality of Evidence	Criterion Met?
July 4, 2017	Utah Final Demonstration, p. 10	Sufficient	Yes

Schedule and Procedural Requirements

In addition to technical demonstration requirements, 40 CFR 50.14(c) and 40 CFR 51.930 specify schedule and procedural requirements an air agency must follow to request data exclusion. Table 9 outlines the EPA's evaluation of these requirements.

Table 9. Schedules and Procedural Criteria

Criterion	Reference	Details	Met Criterion
Did the agency provide prompt public notification of the event?	40 CFR 50.14 (c)(1)(i)	Utah Final Demonstration, p. 9	Yes
Did the agency submit an Initial Notification of Potential Exceptional Event and flag the affected data in the EPA's AQS?	40 CFR 50.14 (c)(2)(i)	Initial Notification for the July 4 demonstration received via email February 2, 2019; Flags applied Aug. 18, 2017 (FRM data) and March 27, 2018 (Primary FEM data)	Yes
Did the initial notification and demonstration submittals meet the deadlines for data influenced by exceptional events for use in initial area designations, if applicable? Or the deadlines established by the EPA during the Initial Notification of Potential Exceptional Events process, if applicable?	40 CFR 50.14 Table 2 40 CFR 50.14 (c)(2)(i)(B)	The demonstration was submitted prior to the identification of a deadline. The revised demonstration was submitted two days after the EPA requested additional information.	Yes

Were all public comments received submitted to the EPA?	40 CFR 50.14(c)(3)(v)(B)	The submission letter stated one comment was received (in support of a clear causal relationship), but the comment was not submitted to the EPA with the initial demonstration. The comment letter was included in the Utah Final Demonstration.	Yes

CONCLUSION

The EPA has reviewed the documentation provided by DAQ to support claims that July 4th fireworks emissions caused exceedances of the 2006 24-hour $PM_{2.5}$ NAAQS at the Rose Park monitoring station on July 4, 2017. Because the initial demonstration submitted by Utah did not satisfy the requirements of the EER, the EPA requested additional information to establish the clear causal relationship and satisfy the delivery of public comments requirements of the EER. Utah provided a revised demonstration, and the EPA has augmented the information provided in the Utah Final Demonstration with regard to historical data comparisons and regulatory significance. The EPA has determined that the flagged exceedance at this monitoring station on July 4, 2017, meets the definition of a fireworks exceedance to be treated in the same manner as an exceptional event: the event affected air quality in such a way that there exists a clear causal relationship between the event and the monitored exceedance, and was not reasonably controllable or preventable. Therefore, the EPA concurs with the exceptional event claim. Any relevant, future proposed notice determining attainment and/or clean data will include the opportunity for the public to comment on our concurrence on this exceptional event, and the EPA will consider any comments received in our final action.